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March 29, 2004

Mr. Burl Haar
Executive Secretary
Minnesota Public Utilities Commission
121 East Seventh Place, Suite 350
St. Paul, MN 55101

RE: Certificate of Need Application by Mankato Energy Center, LLC
Docket No. IP6345/CM-03-1884

Dear Mr. Haar:

Mankato Energy Center, LLC ("Mankato Energy"), a wholly owned subsidiary of Calpine Corporation submits this information to supplement Mankato Energy's application to the Minnesota Public Utilities Commission (the "Commission") for a Certificate of Need for a 355-megawatt (based on winter conditions) natural gas-fired combined cycle power plant. The power plant, to be known as the Mankato Energy Center (the "Facility"), is proposed to be located in Lime Township, Blue Earth County, north of the City of Mankato. The Certificate of Need Application ("Application") was submitted to the Commission on March 2, 2004.

The Minnesota Department of Commerce ("DOC"), in its comments dated March 12, 2004, on the completeness of the Application, recommended that the Commission find the Application complete upon Mankato Energy's submittal of additional information with respect to the following three requirements:

- Minn. Rule 7849.0250, Item A(3) – availability of fuel beyond 2015;
- Minn. Rule 7849.0250, Item C(9) – projected escalation rates for fuel costs and operating and maintenance; and
- Minn. Rule 7849.0310—0320 – environmental information on the proposed Facility and for each alternative considered.

The Minnesota Center for Environmental Advocacy ("MCEA") also submitted comments on March 12, 2004. MCEA, citing Minnesota Rule 7849.0250, Item B, requested that the Commission require an analysis of a "wind-gas combination alternative" in the record. MCEA noted that "[s]uch alternative may involve purchased wind power, and would not need to be limited to the site of the natural gas generation facility."

During the course of the hearing on March 23, 2004, the Commission voted unanimously to accept the second staff recommendation regarding completeness of the application with the proviso that the information identified by MCEA as missing be included in the

supplemental filing along with the information identified by DOC as missing. Once submitted, the filing would be deemed substantially complete.

In accordance with the Commission's directive, the information requested by both the DOC and MCEA is contained in this enclosure and in the Site Permit Application, which was submitted to the Minnesota Environmental Quality Board ("EQB") on March 4, 2004. A copy of the Site Permit Application was also submitted to the Commission on that day, but not made part of the record. Mankato Energy is submitting 15 additional originals of the Site Permit Application concurrently with submittal of this information to facilitate the Commission's distribution and review of this information, and requests that the Site Permit Application be made part of the record in this proceeding. It should be noted that the EQB Chair accepted the Site Permit Application as complete on March 15, 2004.

Copies of this letter and the supplement, not including the Site Permit Application, have been served upon the persons on the attached service list. For those persons on the service wishing to view the Site Permit Application, reference is made to the web address below.

www.eqb.state.mn.us/Docket.html

If you have any questions or comments, please contact Kent Morton by telephone at 847-484-7746 or by e-mail at kmorton@calpine.com.

Sincerely,

Mankato Energy Center, LLC

James J. Shield Jr

James J. Shield
Vice President, Business Development

Enc.

CC: Attached List

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

IN THE MATTER OF THE APPLICATION FOR A CERTIFICATE OF NEED FOR MANKATO ENERGY LLC, A WHOLLY OWNED SUBSIDIARY OF CALPINE CORPORATION.	**MPUC DOCKET NO. IP6345/CN-03-1884** **SUPPLEMENTAL INFORMATION AND REPLY COMMENTS OF MANKATO ENERGY**

Introduction

On March 23, 2004, the Minnesota Public Utilities Commission ("Commission") held a hearing on the referenced matter. The hearing was intended to address three issues: (1) completeness of the application submitted by Mankato Energy Center, LLC ("Mankato Energy"); (2) referral of the case to the Office of Administrative Hearings; and (3) joint need and siting hearings. Commission staff made recommendations with regard to each of these three issues. Specifically, staff recommended that the Commission:

> (1) "[R]equire that Mankato Energy submit a supplement containing the information identified as missing by the Department and accept the application as substantially complete contingent upon submission of that filing, but with the understanding that additional information may have to be provided by Calpine to the Environmental Quality Board and the Department of Commerce to facilitate preparation of an environmental review document and thorough review of the proposed project";
>
> (2) "[R]efer the case to the Office of Administrative Hearings for a contested case proceeding"; and
>
> (3) "(a) [D]etermine that a joint hearing on need and siting under Minn. Stat. § 216B.243, subd. 4 and Minn. Stat. § 116C.57, subd. 2d is feasible, more efficient than separate hearings, and may further the public interest and (b) if a joint hearing is acceptable to the Environmental Quality Board, authorize staff to

request at the prehearing conference that the assigned administrative law judge set up a hearing schedule allowing consideration of both need and siting issues in at least some of the sessions."

At the hearing, the Commission agreed to accept staff's recommendations with the proviso that the first recommendation include information identified as missing by the Minnesota Center for Environmental Advocacy ("MCEA") as well as that information identified as missing by the Department of Commerce ("DOC").

In accordance with the Commission's directive, Mankato Energy respectfully submits the following supplemental information and comments in the above referenced matter.

Reply to Comments of the Department of Commerce

On March 12, 2004, the DOC submitted comments on the completeness of the Certificate of Need Application filed by Mankato Energy on March 2, 2004 ("Application"). The DOC recommended that the Commission declare the Application complete upon submission of the data requested in their comments. Mankato Energy has supplied responses to the information requested by the DOC, and submits a copy of those responses as part of this reply.

Reply to Comments of the Minnesota Center for Environmental Advocacy

On March 12, 2004, MCEA submitted comments on the completeness of the Application. MCEA requested that the Commission require that the docket include "the analysis of a wind-gas combination alternative." MCEA noted that "[s]uch alternative may involve purchased wind power, and would not need to be limited to the site of the natural gas generation facility." Mankato Energy has supplied a response to the information requested by the MCEA, and submits a copy of that response as part of this reply.

In addition to the replies made to comments received from DOC and MCEA, Mankato Energy is submitting additional copies of the Site Permit Application, which was submitted to the Minnesota Environmental Quality Board ("EQB") on March 4, 2004. One copy was also submitted to the Commission on that day, but not made part of the formal record. Mankato Energy requests that the Site Permit Application be made part of the record in this proceeding at this time. It should be noted that the EQB Chair accepted the Site Permit Application, as submitted to the EQB and as included herein, as complete on March 15, 2004.

Conclusion

In accordance with the Commission's acceptance of staff's recommendation that the Application be deemed substantially complete upon submission of the subject filing, Mankato Energy respectfully requests that the Commission confirm that the Application is substantially complete as of the submittal date.

Dated: March 29, 2004

March 29, 2004
IP-6345/CN-03-1884

In the Matter of a Certificate of Need
Application by Mankato Energy Center, LLC
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Reply to Comments of Minnesota Department of Commerce
Completeness Review of the Application of Certificate of Need for the Mankato Energy Center

DATE: March 29, 2004

DOCKET NO: IP-6345/CN-03-1884

RESPONDANT: Jason Goodwin

REFERENCE: Minnesota Rule 7849.0250, Item A (3)

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1. Minnesota Rule 7849.0250, Item A (3) – Availability of Fuel Beyond 2015

Availability of Fuel Beyond 2015

The table below is a summary of the projected domestic natural gas availability through 2025. The information provided in the table indicates domestic natural gas supplies are predicted to increase beyond 2015 and through 2025. This data is from the Energy Information Administration, 2004 Annual Energy Outlook. 2025 is the last year presented in these materials.

U.S. Gas Supply
(Trillion Cubic Feet)

	2010	**2015**	**2020**	**2025**
Domestic Production	20.60	21.72	23.89	24.09
Net Imports	5.50	6.24	6.47	7.24
Total Supply	**26.09**	**27.95**	**30.36**	**31.33**

Source: Energy Information Administration
2004 Annual Energy Outlook, Reference Case

In addition, at the Commission's Technical Conference on Natural Gas on September 10, 2003, and as part of MPUC Docket No.E-002/M-02-633 (In the Matter of a Petition by Xcel Energy for Approval of a Three-Plant Emissions Reduction Proposal and Rate Rider to Recover Costs), representatives of Northern Natural Gas and CenterPoint Energy discussed potential pipeline infrastructure upgrades that will ensure reliable access to the noted additional gas supplies from a combination of Canadian, Rocky Mountain, and Mid-Continent sources. Any infrastructure upgrades implemented to serve the two Xcel

Energy plants that will be converted from coal to natural gas will also benefit the proposed Facility. The addition of infrastructure to access additional supplies that are currently not available to Minnesota will further help to enhance availability and reduce price volatility of natural gas.

Reply to Comments of Minnesota Department of Commerce
Completeness Review of the Application of Certificate of Need for the Mankato Energy Center

DATE: March 29, 2004

DOCKET NO: IP-6345/CN-03-1884

RESPONDANT: Jason Goodwin

REFERENCE: Minnesota Rules 7849.0250, Item C (9)

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2. Minnesota Rules 7849.0250, Item C (9) – Projected Escalation Rates for Fuel Costs and Operating and Maintenance ("O&M")

Projected Escalation Rate for Operating and Maintenance Costs

An escalation rate of 2.5 percent was used in the cost analysis for O&M costs.

Projected Escalation Rates for Fuel Costs

Natural Gas Escalation:

A forecast of the delivered cost of natural gas for the Facility through 2025 in 2002 dollars is shown in Table 1 (Column 3). This forecast is based on the Department of Energy's Energy Information Administration's ("EIA") most recent Reference Case and represents the price of gas delivered into Northern Natural Gas Company ("NNG") from Northern Border at Ventura, Iowa or Welcome, Minnesota. The gas delivery arrangements on NNG to deliver gas to the plant meter remain to be determined but the variable cost of this short-haul delivery service is expected to be small. As such, the price of gas delivered to the plant should not be materially different from the prices shown.

In addition to the forecast developed based on the EIA's forecast of the average wellhead price and the estimated basis from Henry Hub to the Ventura market center, Table 1 also shows the EIA's forecast for the average natural gas price delivered to electric generators in the West North Central census region, which includes Minnesota (Column 4). The two forecasts agree very closely.

Table 1
Mankato Energy Center
Natural Gas Price Forecasts through 2025

	(1) Lower 48 Avg. Wellhead Price (2002$/Mcf)	(2) Henry Hub Price (2002$/Mcf)	(3) Price into NNG from N. Border (2002$/Mcf)	(4) Price to Electric Generators (2002$/MMBtu)
2005	3.54	3.89	4.04	4.06
2006	3.48	3.83	3.98	3.95
2007	3.53	3.88	4.03	3.96
2008	3.64	4.00	4.15	4.05
2009	3.47	3.82	3.97	3.92
2010	3.40	3.74	3.89	3.93
2011	3.56	3.92	4.07	4.08
2012	3.75	4.13	4.28	4.24
2013	3.93	4.32	4.47	4.44
2014	4.01	4.41	4.56	4.61
2015	4.19	4.61	4.76	4.71
2016	4.22	4.64	4.79	4.77
2017	4.23	4.65	4.80	4.80
2018	4.17	4.59	4.74	4.74
2019	4.13	4.54	4.69	4.63
2020	4.28	4.71	4.86	4.71
2021	4.45	4.90	5.05	4.88
2022	4.42	4.86	5.01	4.90
2023	4.42	4.86	5.01	4.88
2024	4.42	4.86	5.01	4.88
2025	4.40	4.84	4.99	4.86

Sources: Col. 1: U.S. Department of Energy, Energy Information Administration (EIA)
Annual Energy Outlook 2004, Reference Case

Col. 2: Average wellhead price (col. 1) plus 10%
(Based on EIA Analysis Paper)

Col. 3: Henry Hub price (col. 2) plus NNG-Ventura basis of -$0.15/Mcf
(Based on Gas Daily index prices for 2002-03)

Col. 4: Annual Energy Outlook 2004, Reference Case
West North Central Region

Fuel Oil Escalation:

A forecast of the delivered cost of fuel oil for the Facility through 2025 in 2002 dollars is shown in Table 2. As with the natural gas forecast, this forecast is based on the EIA's most recent Reference Case.

Table 2
Price of Distillate Oil to Electric Generation Sector
West North Central Region

Year	2002$/MMBtu
2005	5.14
2006	5.06
2007	5.01
2008	5.02
2009	5.02
2010	5.00
2011	5.02
2012	5.06
2013	5.09
2014	5.12
2015	5.18
2016	5.28
2017	5.39
2018	5.50
2019	5.56
2020	5.61
2021	5.62
2022	5.61
2023	5.60
2024	5.62
2025	5.70

Source: Energy Information Administration 2004 Annual Energy Outlook, Reference Case

Reply to Comments of Minnesota Department of Commerce
Completeness Review of the Application of Certificate of Need for the Mankato Energy Center

DATE: March 29, 2004

DOCKET NO: IP-6345/CN-03-1884

RESPONDANT: Jason Goodwin

REFERENCE: Minnesota Rules 7849.0310 and 7849.0320

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3. Minnesota Rules 7849.0310 and 7849.0320 Environmental Information on the Proposed Facility and for Each Alternative Considered.

Environmental information on the proposed Facility is contained in the Site Permit Application, which was submitted to the Minnesota Environmental Quality Board ("EQB") on March 4, 2004. A copy was also submitted to the Commission on that day. The EQB Chair accepted the Site Permit application as complete on March 15, 2004.

The Certificate of Need ("CON") Application describes the following alternatives to the proposed Facility:

1) Purchased Power Alternative
2) Alternative of Performing Upgrades to Existing Resources
3) New Transmission Alternative
4) Minnesota Transmission
5) No Facility Alternative
6) Coal Alternative
7) Oil-Fired Combustion Turbine Alternative
8) Simple-Cycle Combustion Turbine Alternative
9) Alternative of Customer-Owned Distributed Generation
10) Demand Side Management Alternative
11) Renewable Alternatives
    a) Wind Power
    b) Solar Power
    c) Hydropower
    d) Biomass
12) Alternative of Emerging Technologies
    a) Fuel Cells
    b) Microturbines
    c) Batteries
    d) Pumped Storage
    e) Compressed Air
    f) Superconducting Magnets

The environmental, technological, and economical attributes of these alternatives are generally described in the Application. Mankato Energy performed a detailed cost comparison of the two alternatives it considered to merit a more comprehensive evaluation based on the compatibility of these other means of satisfying energy needs in Minnesota with (i) the limitations of the Facility site boundaries, (ii) compatibility of the alternate source of energy with the business model of Calpine Corporation, the parent company of Mankato Energy, (iii) cost-effectiveness when compared with the portion of the Facility that is the subject of the Application, and (iv) commercial viability. The two alternatives considered in more detail by Mankato Energy included:

- Oil-Fired Combustion Turbine (see Section 5.2.8 and Table 5-2); and
- Simple-Cycle Combustion Turbine Alternative (see Section 5.2.9 and Table 5-2)

Additional environmental comparisons of these two alternatives are provided below.

OIL-FIRED COMBUSTION TURBINE ALTERNATIVE ANALYSIS

The following discussion contrasts the proposed non-exempt natural gas fired combined cycle system with the oil-fired combined cycle alternative described in Section 5.2.8 of the Application. Both the non-exempt natural gas fired combined cycle system and the oil-fired combined cycle alternatives are described more fully below.

Proposed (Non-Exempt) Facility Summary

The equipment associated with the natural gas-fueled power plant proposed by Mankato Energy is listed below. This equipment, which is compatible with the equipment associated with the portion of the Facility that is exempt from the CON process, will provide 355/325 MW (winter/summer) of electrical generating capacity.[1] This information is provided for comparison in the alternative discussion to follow and in connection with the discussion of the wind-gas alternative suggested by the Minnesota Center for Environmental Advocacy on its comments submitted on March 12, 2004.

- One combined-cycle combustion turbine ("CT") with exhaust stack firing primarily natural gas; 10% annual capacity factor for distillate oil use.
- One heat recovery steam generator ("HRSG") with natural gas-fired duct burner.
- Additional five cells of cooling tower capacity (12 cells total) (compared to CON-exempt equipment of seven cells).
- Slightly larger water supply and discharge lines and slightly increased gas pipeline size (compared to CON-exempt equipment).
- Storage for 450,000 gallons of distillate oil.

[1] The equipment proposed by Mankato Energy to be part of the Facility that is the subject of this proceeding, specifically the CT and HRSG, will be the same model/manufacturer as will be used in the portion of the Facility that is exempt from the CON process. It is necessary to use complementary equipment so as to maintain plant performance, reduce operation and maintenance costs, and better manage spare part inventories.

There will be one steam turbine/generator associated with the entire Facility. The single steam turbine will be used by the CT/HRSG trains associated with both the exempt and non-exempt portions of the Facility.

Oil-Fired Alternative Description

The equipment associated with the oil-fired alternative is listed below. This equipment, which is compatible with the equipment associated with the portion of the Facility that is exempt from the CON process, will provide 355/325 MW (winter/summer) of electrical generating capacity.

- One combined cycle CT with exhaust stack firing 100% distillate fuel oil with 0.05% sulfur content.
- One HRSG with duct burner firing natural gas, which is the same as for the proposed (non-exempt) Facility.
- Additional five cooling tower cells (total of 12 cells) (compared to CON-exempt equipment of seven cells.) This results in the same total size as for the proposed non-exempt Facility
- Slightly larger water supply and discharge lines (compared to CON-exempt equipment). The lines will be the same total size as for the proposed non-exempt Facility.
- Gas supply pipeline that is slightly smaller that associated with the non-exempt Facility because additional non-exempt capacity will not be supplied by gas.
- Additional oil tankage of approximately 3,000,000 gallons (approximately one week of firing).
- Additional RO/Demineralizer equipment to support the increased demineralized water requirement of 250 gallons per minute needed to control NO_x creation by the combustion turbine.

As with the natural gas-fired (non-exempt) Facility proposed by Mankato Energy and described above, there will be one steam turbine/generator associated with the entire oil-fired facility. The single steam turbine will be used by the CT/HRSG trains associated with both the exempt and non-exempt portions of the Facility.

Because there will be a HRSG in this case, we have assumed that there would be duct burners. However, we have assumed natural gas firing of those duct burners. Oil-firing of duct-burners is unlikely due to potential problems with fouling.

Note also that there will continue to be a natural gas fired auxiliary boiler in the oil-fired case. It is assumed to be gas-fired because it will be required for the CON-exempt equipment. Because the auxiliary boiler will be the same in both cases, its effects are not shown in the comparisons that follow.

Oil-Fired Alternative Analysis

- *The estimated range of land requirements for the facility with a discussion of assumptions on land requirements for water storage, cooling systems, and solid waste storage.*

The oil-fired plant would require additional space to accommodate additional oil storage and truck unloading capacity. Additional space would not be required for any other reasons. Mankato Energy estimates the additional oil storage requirement would be approximately one acre.

There would be no change in solid waste storage requirements between the simple cycle alternative and the proposed alternative.

- *The estimated amount of vehicular, rail, and barge traffic generated by construction and operation of the facility.*

There would be no change in the amount of vehicular, rail, and barge traffic associated with the construction of the oil-fired plant. Changes in traffic for this type of facility during operations would be primarily affected by fuel use patterns. The 100% distillate oil option will require significantly increased traffic for fuel delivery. The difference in total fuel oil usage (10% oil firing capacity compared to the 100% oil fired alternative for 355/325 MW winter/summer additional capacity) is estimated to be 140,600,000 gallons per year. This reflects 18,750 additional truck trips per year or approximately 50 additional trips per day. In order to efficiently receive the fuel oil shipments, four additional truck unloading stations would be required.

- *The expected regional source of fuel for the facility.*

For the proposed alternative, a capacity factor of up to 100% fuel oil is allowed. The regional source, i.e., refinery, of that oil and the source of oil for a 10% oil-fired alternative would likely be the same assuming that the regional source of distillate oil has adequate capacity. If the regional source does not have adequate capacity, a second or third source of distillate would be required.

- *The typical fuel requirement (in tons per hour, gallons per hour, or thousands of cubic feet per hour) during operation at rated capacity and the expected annual fuel requirement at the expected capacity factor.*

Fuel requirements are summarized in the following table. These values are for 355/325 MW (winter/summer) of additional power that is the subject of the CON[2].

Fuel and Averaging Time	One - 100 % Oil Fired Combined Cycle Turbine - Duct Burner Firing Gas	One - Gas/Oil Fired Combined Cycle Turbine - Duct Burner Firing Gas
Natural Gas - 100% hourly	0.7843 million ft^3/hour	2.7843 million ft^3/hour
Fuel Oil - 100% hourly	14,640 gal/hour	14,640 gal/hour
Natural Gas - 100% annual	6,871 million ft^3/year	24,391 million ft^3/year
Fuel Oil - annual	128 million gallons/year	12.8 million gallons/year

- *The expected rate of heat input of the facility in Btu per hour during operation at maximum rated capacity.*

The heat input rates of an oil-fired alternative compared to the proposed alternative are summarized below. These values are for 355/325 MW (winter/summer) additional power that is the subject of the CON. [2]

Fuel	One - 100 % Oil Fired Combined Cycle Turbine - Duct Burner Firing Gas	One - Gas/Oil Fired Combined Cycle Turbine - Duct Burner Firing Gas
Natural Gas	800 million Btu/hr[2]	2,840 million Btu/hr
Fuel Oil	2,050 million Btu/hr	2,050 million Btu/hr

- *The typical range of the heat value of the fuel (in Btu per pound, Btu per gallon, or Btu per 1000 cubic feet) and the typical average heat value of the fuel.*

The fuel sources for the oil-fired alternative and for the proposed alternative are the same; therefore, there will be no difference in the typical ranges and in the average heat value between alternatives. The heat values used in analysis are:

1,020 Btu/scf – natural gas
140,000 Btu/gallon – distillate oil

- *The typical ranges of sulfur, ash, and moisture content of the fuel.*

Ash and moisture content of fuel oil will not vary significantly and any variations would be the same for the oil-fired alternative as for the oil-fired portion of the proposed alternative.

Sulfur content of fuel oil for this alternative and for the proposed alternative is set by a proposed permit limitation of 0.05% sulfur. Moisture and ash contents for both fuels are

[2] For the oil-fired alternative it is not possible to operate solely on distillate oil. It is necessary to combust natural gas in the duct burner for the Facility.

identified as nil. (Reference: Babcock and Wilcox. Steam Its Generation and Use. 38th Edition, 1972)

- *The estimated range of trace element emissions and the maximum emissions of sulfur dioxide, nitrogen oxides, and particulates in pounds per hour during operation at rated capacity.*

The following summarizes maximum emissions of sulfur dioxide ("SO_2"), nitrogen oxides ("NO_x"), particulate matter ("PM"), and particulate matter less than or equal to 10 microns ("PM10") in pounds per hour at rated capacity under the listed conditions. The emissions calculations assume that controls on an oil-fired alternative will be the same as those proposed when burning distillate oil for the proposed case (gas/oil). Maximum emissions are estimated only for the 355/325 MW (winter/summer) additional capacity.

This first table compares emissions from the primary fuel in each case:

	One - 100 % Oil Fired Combined Cycle Turbine - with Duct Burners Firing Gas	**One - 100% Gas Fired Combined Cycle Turbine - with Duct Burners Firing Gas**
	(Lbs/hr at rated capacity)	**(Lbs/hour at rated capacity)**
SO_2	86.25	3.41
NO_x	53.29	36.71
PM	72.8	10.0
PM10	72.8	10.0

This second table compares the case of burning back-up distillate oil to the 100% distillate oil fired case:

	One - 100 % Oil Fired Combined Cycle Turbine – with Duct Burner Firing Gas	**One - 100% Oil Fired Combined Cycle Turbine - with Duct Burner Firing Gas**
	(Lbs/hr at rated capacity)	**(Lbs/hour at rated capacity)**
SO_2	86.25	86.25
NO_x	53.29	53.29
PM	72.8	72.8
PM10	72.8	72.8

Emissions of SO_2, NO_x, PM, and PM10 for the two distillate oil-fired cases are the same on an hourly basis because it has been assumed that the same vendor guarantees available for the oil burning portion of the proposed alternative will be the same as for the 100% oil fired case.

The range of trace element concentration in the fuel is unaffected by this alternative as compared to the proposed Facility. The fuel sources are the same; therefore, the range in trace element concentrations will be the same in those fuels.

Trace element emissions (metals) are primarily from distillate oil combustion. Therefore, trace element emissions will increase for the 100% oil fired case when compared to gas firing. Trace element emissions are summarized below.

	One - 100 % Oil Fired Combined Cycle Turbine - with Duct Burners Firing Gas	**One - 100% Gas Fired Combined Cycle Turbine - with Duct Burners Firing Gas**
	(Lbs/hr at rated capacity)	**(Lbs/hour at rated capacity)**
Arsenic	0.0227	0.000157
Beryllium	0.000645	0.00000941
Cadmium	0.0107	0.000863
Chromium	0.0236	0.00110
Cobalt	0.0000659	0.0000659
Lead	0.0291	0.000392
Manganese	1.62	0.000298
Mercury	0.00266	0.000204
Nickel	0.0111	0.00165
Selenium	0.0513	0.0000188

Trace element emissions, on a maximum pounds per hour basis, will be the same for the proposed case when burning back-up oil as for the 100% oil fired case.

Trace element emissions for the proposed project are detailed in the Air Emission Risk Assessment submitted to the Minnesota Pollution Control Agency in coordination with the Minnesota Environmental Quality Board to support the preparation of the Site Permit.

- *The estimated range of maximum contributions to 24-hour average ground level concentrations at specified distances from the stack of sulfur dioxide, nitrogen oxides, and particulates in micrograms per cubic meter during operation at rated capacity and assuming generalized worst-case meteorological conditions;*

The following table lists maximum 24-hour average ground level concentrations for SO_2, NO_2, and PM10. These estimates are at maximum hourly capacity for 24-hours and are predicted to occur with 320 meters of the stack.

	One - 100 % Oil Fired Combined Cycle Turbine - with Duct Burner Firing Gas	**One - Gas/Oil Fired Combined Cycle Turbine - with Duct Burner Firing Gas**	**Applicable National/ Minnesota Ambient Air Quality Standard**
	(ug/m3 at rated capacity)	**(ug/m3 at rated capacity)**	**(ug/m3)**
SO2 [(1)]	19.9	19.9	365
NO_2 [(2)]	15.6	15.6	NA
PM10 [(3)]	15.5	15.5	150

[(1)] reflects high-second-high value for comparison to standard.
[(2)] reflects high-first-high since there is no applicable standard at this averaging time.
[(3)] reflects high-six-high over 5 years for comparison to standard.

The maximum impacts in this case are the same because the worst-case emissions estimates for the worst-case analysis are the same, i.e., 100% oil firing.

The data listed in the table above do not represent a regulatory analysis for comparison to National or Minnesota Ambient Air Quality Standards ("AAQS"). The analysis was done to provide a specific comparison between the equipment that is different in the two cases. The results reflect only the impact of the listed equipment operating alone. Other sources at the facility are not reflected in the table. Background concentrations are also not considered in the above table. Total facility impacts are addressed in the Site Permit Application.

- *Water use by the facility for alternate cooling systems, including:*
  (1) the estimated maximum use, including the groundwater pumping rate in gallons per minute and surface water appropriation in cubic fee per second
  (2) the estimated groundwater appropriation in million gallons per year;
  (3) the annual consumption in acre-feet;

Alternative types of cooling systems (other than cooling towers) were not considered for this site due to the environmental benefits associated with "recycling" recycled wastewater received from the City of Mankato publicly owned treatment works ("POTW") as well as the limited plant site area. Additionally, once-through cooling was not considered because of the substantially greater quantities of water required and the associated environmental impacts. Air-cooled condensers also were not included because of several factors, including a lower system efficiency and greater impacts on land area, noise and aesthetics. For either alternative there will not be a need to appropriate groundwater or surface water. See also discussion under the following bullet item.

- *The potential sources and types of discharges to water attributable to operation of the facility.*

The sources and types of discharges for the oil-fired alternative and the proposed non-exempt facility will be the same. The water requirement for the oil-fired alternative will be slightly larger than for the non-exempt portion of the Facility. Water demand in the oil-fired alternative will increase by approximately 500,000 gallons per day, as distillate oil combustion requires demineralized water to be injected into the combustor to control NO_x formation. This water will be emitted as water vapor from the HRSG stack. The water appropriation for either alternative will be from the Mankato POTW.

Both cases will result in a decrease in volume of water discharged to the Minnesota River due to evaporative losses in the cooling towers compared to the no build option. The evaporative loss will be small in relationship to the river flows, even during periods of very low flow.

Both cases will include effluent treatment to reduce phosphorus concentrations. The final design criteria are being developed, however current estimates indicate that the facility will remove about 75% of the phosphorus it receives from the City of Mankato's wastewater treatment plant. Therefore, the proposed facility, whether oil or gas fired will

result in decreased phosphorus loading to the Minnesota River. Phosphorus is a key factor influencing the lower dissolved oxygen impairments of the lower Minnesota River. Therefore, reduction in phosphorus will benefit the Minnesota River.

- *Radioactive releases, including: for fossil-fueled facilities, the estimated range of radioactivity released by the facility in curies per year.*

No radioactive releases are expected from the proposed Facility or the oil-fired alternative.

- *The potential types and quantities of solid wastes produced by the facility in tons per year at the expected capacity factor.*

Solid waste production is minimal and would not be different between the oil-fired alternative and proposed alternative.

- *The potential sources and types of audible noise attributable to operation of the facility.*

There will be no significant difference in noise from equipment associated with the oil-fired alternative and with the proposed non-exempt Facility. There will be increased noise due to increased truck traffic related to distillate oil deliveries.

- *The estimated work force required for construction and operation of the facility.*

The oil-fired alternative would require essentially the same resources to construct as the non-exempt portion of the proposed Facility.

- *The minimum number and size of transmission facilities required to provide a reliable outlet for the generating facility.*

Because the power generated in each case is the same there would be no difference between alternatives in the number and size of transmission facilities required.

Summary/Conclusions

The Facility will be capable of using low sulfur distillate oil as a back-up fuel. The use of the distillate oil will be restricted to ten percent of the Facility's operating hours based on 12-month rolling average. The incorporation of distillate oil capability increases the operating flexibility of the Facility in that switching fuel sources may mitigate restrictions or interruptions of natural gas supplies. Limiting the fuel source(s) for the Facility to only distillate oil would reduce this operating flexibility.

As shown in the prior discussions the environmental impacts associated with an oil-fired combustion turbine would be significantly greater than the impacts associated with the proposed Facility. For example, emissions of sulfur dioxide, carbon monoxide, nitrogen oxides, and particulate matter would all be greater compared to combustion of natural

gas. Water use would also be greater, and land use requirements also would be greater due to the need for large quantities of on-site oil storage capacity needed to support continuous operation.

Finally, the cost of operating an oil-fired facility is greater than operating a natural gas-fired facility in terms of both fuel costs and operating and maintenance costs.

SIMPLE-CYCLE COMBUSTION TURBINE ALTERNATIVE ANALYSIS

The following discussion contrasts the proposed non-exempt natural gas fired combined cycle system with the simple cycle alternative described in Section 5.2.9 of the Application. A summary description of the non-exempt natural gas fired combined cycle system was provided above. The simple cycle alternative is described more fully below.

Simple Cycle Alternative Description

The simple-cycle alternative for 355/325 MW (winter/summer) non-exempt capacity would have the following equipment:

- Two simple-cycle combustion turbines with a single exhaust stack firing primarily natural gas; 10% annual capacity factor for distillate oil use.
- No additional HRSG; no additional duct burners.
- Cooling tower will be the same as in CON-exempt case; seven cells total; five cells less than proposed non-exempt Facility.
- Slightly smaller water supply and discharge lines compared to proposed non-exempt Facility.
- Assumption of increased oil storage to maintain storage equivalent to 20 hours of oil-based capacity. This will increase oil storage by approximately 600,000 gallons above that required for the proposed non-exempt facility. Total oil storage capacity would be approximately 900,000 gallons.

There will be one steam turbine/generator overall, which will receive steam from the CON-exempt combined cycle combustion turbine system. The steam turbine will be the same size regardless of whether the non-exempt portion of the Facility is built or not.

The major differences between the simple cycle alternative and proposed non-exempt Facility are the lack of a second HRSG, less cooling tower requirement, and the addition of a second combustion turbine. The second combustion turbine is required to address loss of capacity at associated with the steam cycle and duct burner capability in the HRSG.

Note also that there will continue to be a natural gas fired auxiliary boiler in the oil-fired case. It will be required for the CON-exempt equipment. Since the auxiliary boiler will be the same in both cases, its effects are not shown in the comparisons that follow.

A significant advantage that a combined cycle facility has over a simple cycle facility is greater efficiency. The heat rate, the industry measure of efficiency, is the heat

(measured in Btus) required to generate 1 kWh of electricity. Typically, the heat rate of a simple-cycle facility is about 11,000 Btu/kWh (Higher Heating Value) while the heat rate associated with the combined cycle portion of the Facility is about 7,000 Btu/kWh (HHV). The loss of efficiency from combined to simple cycle means more fuel use for the same amount of electric power, more emissions per the amount of power produced, and a higher cost of power. Moreover, the need to install a second CT to make up for the capacity lost without the steam cycle and duct burner capability increases the capital cost of the plant. It would require the addition of a fourth transformer as well as require changes to the switchyard.

Simple Cycle Alternative Analysis

- *The estimated range of land requirements for the facility with a discussion of assumptions on land requirements for water storage, cooling systems, and solid waste storage.*

A simple cycle plant will require approximately the same land area. Less land area would be required due to the lack of a HRSG and the lower number of cooling tower cells required. However, additional land would be required for oil storage and the second CT. The net change is expected to minimal. It is unlikely that the actual site size would change in any case given the layout of the facility and specifics of the site.

There would be no change in solid waste storage requirements between the simple cycle alternative and the proposed alternative.

- *The estimated amount of vehicular, rail, and barge traffic generated by construction and operation of the facility.*

It is expected that traffic patterns would change slightly during the construction phase. A HRSG requires more equipment deliveries than the CT that would be used to replace the incremental loss of power were the combined cycle replaced by the simple cycle alternative. The additional five cells in the cooling tower associated with combined cycle proposal would also not be required; thus, reducing equipment deliveries associated with that structure.

Changes in traffic for this type of facility during operations are primarily affected by fuel use patterns. The fuel mix for the simple cycle alternative is primarily natural gas with a provision for up to 10% distillate fuel oil. Changes in the amount of gas usage do not affect traffic counts. Changes in fuel oil usage would affect traffic counts. Given that a simple cycle facility is less efficient overall, that difference in efficiency would translate to increased fuel oil requirements should back-up fuel oil be required. The difference in total fuel oil usage (at 10% capacity) is estimated to be 10,699,714 gallons per year. This reflects 1,529 additional truck trips per year.

- *The expected regional source of fuel for the facility.*

The simple cycle alternative would have the same fuel sources as the proposed non-exempt, combined cycle facility.

- *The typical fuel requirement (in tons per hour, gallons per hour, or thousands of cubic feet per hour) during operation at rated capacity and the expected annual fuel requirement at the expected capacity factor.*

Fuel requirements are summarized below. These values are for the 355/325 MW (winter/summer) additional power that is the subject of the CON.

Fuel and Averaging Time	**Two Simple Cycle Turbines**	**One Combined Cycle Turbine with Duct Burner**
Natural Gas - 100% hourly	3.828 million ft^3/hour	2.7843 million ft^3/hr
Fuel Oil - 100% hourly	29,280 gallons/hour	14,640 gallons/hour
Natural Gas - 100% annual	32,120 million ft^3/year	24,391 million ft^3/yr
Fuel Oil - 10% annual	25.6 million gallons/year	12.84 million gallons/year

- *The expected rate of heat input of the facility in Btu per hour during operation at rated capacity.*

The heat input rates of a simple cycle alternative compared to the proposed alternative are summarized below. These values are for the 355/325 MW (winter/summer) additional power that is the subject of the CON.

Fuel	**Two Simple Cycle Turbines**	**One Combined Cycle Turbine with Duct Burner**
Natural Gas	4,160 million Btu/hr	2,840 million Btu/hr
Fuel Oil,	3,928 million Btu/hr	2,852 million Btu/hr[3]

- *The typical range of the heat value of the fuel (in Btu per pound, Btu per gallon, or Btu per 1000 cubic feet) and the typical average heat value of the fuel.*

The fuel sources for the simple cycle alternative and for the proposed alternative are the same and therefore there will be no difference in the typical ranges and in the average heat value between alternatives. The heat values used in this analysis are:

1,020 Btu/scf – natural gas
140,000 Btu/gallon – distillate oil

- *The typical ranges of sulfur, ash, and moisture content of the fuel.*

Sulfur, ash, and moisture content of natural gas will not vary significantly and any variations would be the same for the simple cycle alternative as for the proposed alternative.

[3] Includes natural gas firing in duct burner.

Sulfur content of fuel oil for this alternative and for the proposed alternative is set by a proposed permit limitation of 0.05% sulfur. Moisture and ash contents are negligible for both alternatives. Moisture and ash contents for both fuels are identified as nil. (Reference: Babcock and Wilcox. Steam Its Generation and Use. 38th Edition, 1972)

- *The estimated range of trace element emissions and the maximum emissions of sulfur dioxide, nitrogen oxides, and particulates in pounds per hour during operation at rated capacity.*

The following summarizes maximum emissions of sulfur dioxide ("SO_2"), nitrogen oxides ("NO_x"), particulates, and particulate matter less than or equal to 10 microns ("PM10") in pounds per hour at rated capacity under the listed conditions. The emissions calculations optimistically assume that controls on a simple cycle combustion turbine will be same as those proposed for the combined cycle alternative. In fact, NO_x emissions from a simple cycle combustion turbine will be higher than those from combined cycle machines because of the technical obstacles associated with adapting catalytic controls to simple cycle combustion turbines. Maximum emissions are estimated only for the 355/325 MW (winter/summer) additional capacity. The first table compares emissions when the primarily fuel is natural gas in each case. The second table compares emissions when the primary fuel in fuel oil

Primary Fuel - Natural Gas

	Two Simple Cycle Turbines- 100% Gas	**One Combined Cycle Turbine with Duct Burner - 100% Gas**
	(Lbs/hr at rated capacity)	**(Lbs/hour at rated capacity)**
SO2	4.69	3.41
NOx	439.9	36.71
PM	20.0	10.0
PM10	20.0	10.0

Primary Fuel - Fuel Oil

	Two Simple Cycle Turbines - 100% Back-up Oil Case	**One Combined Cycle Turbine with Duct Burner - 100% Back-Up Oil Case with Gas firing in Duct Burners**
	(Lbs/hr at rated capacity)	**(Lbs/hour at rated capacity)**
SO2	196.44	86.25
NOx	656.35	53.29
PM	109.5	72.8
PM10	109.5	72.8

The range of trace element concentration is unaffected by this alternative as compared to the proposed project. The fuel sources are the same and therefore the range in trace element concentrations will be the same in those fuels. Trace element emissions are summarized below.

There are no trace element emissions factors for natural gas firing of a simple cycle turbine. A comparison of trace element emissions for back-up oil firing is provided below.

Primary Fuel - Fuel Oil

	Two Simple Cycle Turbines - 100% Back-up Oil Case	**One Combined Cycle Turbine with Duct Burner - 100% Back-Up Oil Case with Gas firing in Duct Burners**
	(Lbs/hr at rated capacity)	**(Lbs/hour at rated capacity)**
Arsenic	0.0432	0.0227
Beryllium	0.00122	0.000645
Cadmium	0.0189	0.0107
Chromium	0.0432	0.0236
Cobalt	(1)	0.0000659(1)
Lead	0.0550	0.0291
Manganese	3.10	1.62
Mercury	0.00471	0.00266
Nickel	0.0181	0.0111
Selenium	0.0982	0.0513

(1) Cobalt emission factors are available only for natural gas firing in duct burners.

The simple cycle case shows increased trace element emissions due to increased fuel oil consumption when burning back-up fuel. The amount of increase varies depending on the influence on trace element emissions from the duct burners.

Trace element emissions for the proposed project are detailed in the Air Emission Risk Assessment submitted to the Minnesota Pollution Control Agency in coordination with the Minnesota Environmental Quality Board to support the Site Permit Application.

- *The estimated range of maximum contributions to 24-hour average ground level concentrations at specified distances from the stack of sulfur dioxide, nitrogen oxides, and particulates in micrograms per cubic meter during operation at rated capacity and assuming generalized worst-case meteorological conditions.*

The following table lists maximum 24-hour average ground level concentrations for SO_2, NO_2, and PM10. These estimates are at maximum hourly capacity for 24-hours and are predicted to occur within 320 meters of the stack.

	Two Simple Cycle Turbines	**One Combined Cycle Turbine with Duct Burner firing Gas**	**Applicable National/ Minnesota Ambient Air Quality Standard**
	ug/m^3 at rated capacity	**ug/m^3 at rated capacity**	**ug/m^3**
SO_2 (1)	45.4	19.9	365
NO_2 (2)	192	15.6	NA
PM10 (3)	23.3	15.5	150

(1) reflects high-second-high value for comparison to standard.

(2) reflects high-first-high since there is no applicable standard at this averaging time.
(3) reflects high-sixth-high over 5 years for comparison to standard.

The data listed in the table above do not represent a regulatory analysis for comparison to National or Minnesota Ambient Air Quality Standards ("AAQS"). The analysis was done to provide a specific comparison between the equipment that is different in the two cases. The results reflect only the impact of the listed equipment operating alone. Other sources at the Facility are not reflected in the table. Background concentrations are also not considered in the above table.

The results for the simple cycle alternative are higher due to the need to burn additional fuel oil to achieve the same power output. The results shown for the non-exempt Facility portion above represent the worst-case condition of 24-hours burning fuel oil.

Total Facility impacts are addressed in the Site Permit Application.

- *Water use by the facility for alternate cooling systems, including:*
  (1) the estimated maximum use, including the groundwater-pumping rate in gallons per minute and surface water appropriation in cubic fee per second
  (2) the estimated groundwater appropriation in million gallons per year;
  (3) the annual consumption in acre-feet;

The simple cycle alternative does not require an evaporative cooling system. See further discussion under the following bullet item.

- *The potential sources and types of discharges to water attributable to operation of the facility.*

The simple cycle alternative does not require a cooling water system. The proposed CON-exempt Facility will require a cooling system because a HRSG will be used. The water appropriation for the CON-exempt portion of the Facility will be from the Mankato POTW.

In the simple cycle case, because no evaporative cooling is being used, there would be no evaporative loss for that portion of the Facility. Evaporative losses from the cooling towers will be approximately 40% lower with a simple cycle system for the additional non-exempt capacity as compared to a facility with two combined-cycle systems. However, the change in evaporative loss is not sufficient to recommend a change in alternative to a simple-cycle system. Flows are sufficient in the Minnesota River even with two combined cycle systems and their associated evaporative losses.

Further, there is an asset to water use in this case by the Facility. Any water used by the Facility will be subject to effluent treatment to reduce phosphorus concentrations. The final design criteria are being developed, however current estimates indicate that the Facility will remove about 75% of the phosphorus it receives from the Mankato. Therefore, a combined cycle combustion turbine will result in decreased phosphorus loading to the Minnesota River compared to a simple cycle alternative. Phosphorus is a

key factor influencing the lower dissolved oxygen impairments of the lower Minnesota River. Therefore, reduction in phosphorus will benefit the Minnesota River. Phosphorus reduction actually would be diminished due to less City water used and therefore, scrubbed of phosphorus. A simple cycle plant would result in a net detriment in regards to potential phosphorus loading to the environment when compared to the combined cycle plant.

- *Radioactive releases, including: for fossil-fueled facilities, the estimated range of radioactivity released by the facility in curies per year.*

No radioactive releases are expected from the proposed facility or the oil-fired alternative.

- *The potential types and quantities of solid wastes produced by the facility in tons per year at the expected capacity factor.*

Solid waste production is minimal and would not be different between the simple cycle and proposed alternative.

- *The potential sources and types of audible noise attributable to operation of the facility.*

The change to a simple cycle alternative for the non-exempt portion of the facility could potentially affect the noise analysis due to the addition of a turbine generator, the lack of the HRSG and the lower number of cooling tower cells. An analysis was completed for that alternative facility. The analysis included both the CON-exempt portion and the non-exempt portion. This is important when considering noise because the impacts are additive in a linear fashion. The analysis did not address the addition of the fourth transformer required for the simple cycle alternative.

The results of the analysis for the entire Facility (one combined-cycle system and two simple-cycle turbines) is summarized below:

- At receptor 1, approximately 1,350 feet from the plant, the estimated daytime L_{50} is 53.1 dBA and the estimated nighttime L_{50} is 48.7 dBA. With the combined cycle option, the estimated daytime L_{50} was 53.2 dBA and the estimated nighttime L_{50} was 49.1 dBA. [4]
- At receptor 2, approximately 2,050 feet from the plant, the estimated daytime L_{50} is 48.0 dBA and the estimated nighttime L_{50} is 46.2 dBA. With the combined cycle option, the estimated daytime L_{50} was 48.1 dBA and the estimated nighttime L_{50} was 46.4 dBA.[4]

The Minnesota daytime and nighttime noise standards will be met at both nearby residential receptors. The change to simple cycle for the non-exempt portion would

[4] The difference between daytime and nighttime noise levels is due primarily to decreased background noise at night.

result in a slight decrease in noise – the decrease ranging from 0.1 to 0.4 dBA depending on the condition. If the fourth transformer were to be added this difference would decrease and likely be negligible.

- *The estimated work force required for construction and operation of the facility.*

The simple cycle alternative would require slightly less resources to construct than the proposed alternative since there would be no second HRSG and the cooling tower system would be smaller. These differences are not significant.

- *The minimum number and size of transmission facilities required to provide a reliable outlet for the generating facility.*

The requirement for two simple cycle combustion turbines compared to the proposed combined cycle plant would require an additional transformer and interconnection. Additionally the switchyard would have to be expanded & reworked to accommodate the addition tie-in.

Summary/Conclusions

The exempt portion of the Facility will use combined cycle technology. The decision to use combined-cycle technology rather than simple-cycle technology for that portion of the Facility stemmed from the initial solicitation for power resources issued by Xcel Energy. That solicitation requested both base/intermediate load and peaking capacity. The combined-cycle plant better satisfied the base/intermediate load portion of the solicitation. The ability to fire duct burners located in the HRSG is the method that will be used to meet a part of the peaking needs of Xcel Energy per the terms of the solicitation. By firing duct burners located in the HRSG, the Facility is able to produce more electric power than if the duct burners were not installed. In effect, this configuration allows for a power plant that is capable of producing clean and efficient electric power to meet varying electrical demand types, i.e., both intermediate and peaking.

The reasons for using combined cycle technology for the portion of the Facility that is the subject of this proceeding rather than simple cycle technology fall into two general categories: environmental and economic. The items addressed in this discussion show that the majority of environmental impacts from a simple cycle system are directly related to this difference in efficiency. All air quality impacts are increased with a simple cycle system. Other environmental impacts also increase. Finally, the simple cycle alternative would require an additional transformer as well as modification and expansions of the switchyard.

An economic comparison was set out in the CON Application, and clearly showed that combined cycle technology was more economical than simple cycle technology. A part of that comparison – fuel usage – was described in more detail above. While this is an important issue in terms of project-specific economics, it is also an important issue on a larger scale. By introducing natural gas-fueled intermediate generating resources into an

area, it is actually possible to reduce natural gas consumption while generating the same amount of electric power. The intermediate resources would replace the dispatch of less efficient natural gas fired peaking resources. This issue is made more significant in Minnesota where the majority of generating sources are either baseload or peaking (with very little of anything in between) and where a growing percentage of the generating capacity is expected to come from wind. Further discussion of the compatibility of gas and wind generating resources is described below in response to comments from the Minnesota Center for Environmental Advocacy.

Reply to Comments of Minnesota Center for Environmental Advocacy
Completeness Review of the Application of Certificate of Need for the Mankato Energy Center

DATE: March 29, 2004

DOCKET NO: IP-6345/CN-03-1884

RESPONDANT: Jason Goodwin

REFERENCE: Minnesota Rule 7849.0250, Item B

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1. Minnesota Rule 7849.0250, Item B – Availability of Alternatives to the Facility

Wind-Gas Combination Alternative

Mankato Energy addressed the alternative of replacing the portion of the Facility that is the subject of the Application with a wind plant. See Section 5.2.12.1 of the Application. As noted in the Application with respect to renewable alternatives in general, Calpine Corporation, the parent company of Mankato Energy, has never developed, constructed, owned, or operated renewable generating facilities other than geothermal plants, nor is it in Calpine's corporate mandate to develop, own, or operate such facilities. With respect to the specific alternative of wind generation, Mankato Energy stated:

> The relatively small size of the Facility site effectively precludes the use of wind technology due to the need for large spaces between the windmills. The lack of space would preclude installation of any significant wind generating capacity at the site. In addition, despite recent improvements to increase the reliability and decrease the costs associated with wind power, these measures both fall short of the reliability and cost associated with the generation that is the subject of this Application.

The Minnesota Center for Environmental Advocacy ("MCEA"), in comments submitted to the Commission on March 12, 2004, suggested that a combination of wind energy and natural gas should be included in the docket. MCEA noted that such an alternative "may involve purchased wind power, and would not need to be limited to the site of the natural gas generation facility." MCEA went on to note that "[t]here is the potential that such an alternative could provide the same capacity value as the Calpine proposal, but with lower energy costs."

The threshold issue of whether Calpine is willing to develop, own, or operate a wind plant exists with either the stand-alone alternative addressed in the Application or the combination wind-gas alternative suggested by MCEA. Because Calpine is not willing to enter into a business outside of its corporate mandate, the alternative of a wind-gas project would be made contingent upon entering into a contract, i.e., a purchase power

agreement, with another entity for the acquisition of the wind-generated capacity. The Commission, in its February 6, 2004 Order Granting Exemptions from Filing Requirements and Limiting Scope, *In the Matter of the Application of Calpine Corporation for a Certificate of Need for a Large Electric Generating Facility*, specifically exempted Mankato Energy from discussing the purchased power alternative. This same reasoning applies to any other suggested combination of gas-renewable alternatives available in Minnesota.[5]

Further (and without conceding the need to discuss this issue past the threshold described above), from a practical standpoint the wind-gas alternative *in this proceeding* just does not make sense. Assuming Mankato Energy were to purchase wind energy then resell it as part of its energy resources in Minnesota, the cost of that sale would always be greater than were the provider of the wind energy to sell the energy directly to the ultimate purchaser because, if for no other reasons, there would be no "middle man" or transaction costs involved.

From an environmental standpoint, the impacts associated with the wind-gas alternative would, by definition, always be greater than those impacts associated with the project proposed by Mankato Energy. Mankato Energy has proposed to incrementally expand the portion of the Facility that is exempt from the CON process by adding certain pieces of machinery and equipment that are compatible with the machinery and equipment that comprise the portion of the Facility that is exempt from the CON process. Those pieces of machinery and equipment and the impacts associated therewith would be a part of the overall wind-gas alternative. Adding the impacts associated with the wind portion of the alternative – land use impacts, noise impacts, visual impacts, impacts on birds, etc. – would always be incrementally more than were the natural gas project proposed by Mankato Energy to be constructed without the wind portion of the suggested alternative.

Having pointed out the inappropriateness of the wind-gas combination alternative *in this proceeding*, Mankato Energy is well aware of the benefits inherent in combining these generating sources on a macro scale. On such a scale, combined cycle power generation is extremely complementary with wind generation due to the ease with which the combined cycle generation can follow the energy production of a wind plant or system of wind plants. When operating, a combined cycle plant can "follow" the wind load by ramping up and down quickly. When the wind is blowing hard, the combined cycle plant can be ramped down; when the wind is not blowing or is blowing too softly to turn the wind turbines, the combined cycle plant can be ramped up. Coal and nuclear plants cannot match this ability. In situations where the combined cycle plant is not operating and additional power must be brought on line to make up for a decrease in wind energy delivered into the grid (whether due to the fact that the wind is not blowing or for any other reason), the combined cycle plant is able to meet the demand much more quickly than a coal or nuclear plant, and at a much higher efficiency level than a coal-fired plant. This ability helps to maintain system reliability in areas where wind energy constitutes a significant portion of the area energy mix.

[5] Calpine Corporation is the world's largest generator of renewable geothermal power. As noted in the Application, geothermal energy production is not considered feasible in Minnesota.

On a more project-specific basis, the proposed location of the Facility within the Minnesota electrical grid is ideal for complementing the wind energy generated in the Buffalo Ridge area. This is because the energy from the Buffalo Ridge area follows the same path into the Minneapolis/St. Paul area as would the energy generated by the Facility. Strategically located combined cycle generating plants – like the Mankato Energy Center – will help maintain the reliability of the electric grid as more wind generation is brought on line.